

SOHO Team Joins Elite Ranks

By Paal Brekke

The prestigious Laurels for Team Achievement Award of the International Academy of Astronautics (IAA) was presented to the Solar and Heliospheric Observatory (SOHO) team in September.

The IAA presents the award in recognition of extraordinary performance and achievement by teams of scientists, engineers and managers in the field of astronautics. This honor has been awarded only twice before - to the Russian Mir Space Station team and the US Space Shuttle team.

"Many awards are given for specific scientific achievements or particular technologies. In this case, it's the entire team ... who make it possible to continue getting back science everyday," said Joe Gurman, US Project Scientist for SOHO.

The citation of the award reads: "To the team of scientists, engineers, and managers for the development and operation of a world-class mission leading to substantial advancements in understanding the Sun and the solar-terrestrial relationship. Mankind's knowledge and understanding of the dynamic processes within and around the Sun and the solar-terrestrial interactions have multiplied manifold since SOHO began its operations in 1995."

SOHO Celebrates Eight Years in Space!

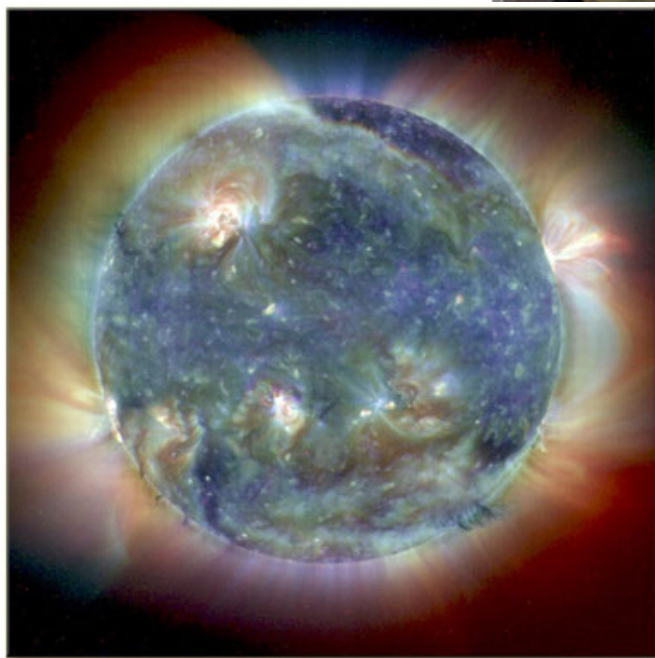
This past December, SOHO celebrated its eight anniversary. Since its launch on Dec. 2, 1995, SOHO has been one of the most successful space missions in history.

The Solar and Heliospheric Observatory (SOHO) has provided an unparalleled breadth and depth of information about the Sun, from its interior, through the hot and dynamic atmosphere, and out to the solar wind. SOHO has continued to revolutionize our understanding of the Sun with its 24 hour-per-day observations of our daylight star. The SOHO spacecraft was nearly lost in space in 1998, but thanks to an amazing rescue operation, the satellite is still in very good shape and continues to deliver excellent science data.

The main objectives of the SOHO mission at launch were to study the structure and dynamics of the solar interior, the heating of the



Center Director Al Diaz gives US Project Scientist for SOHO, Joe Gurman a plaque in recognition of the mission's successful eight years of service.



Most Popular Image: "The Sun as a Sparkling Diamond"

solar corona, and the acceleration of the solar wind. Five years later, science teams from around the world have made great strides toward answering these "big three" questions. At the same time, SOHO's easily accessible, spectacular data and basic science results have captured the imagination of the space science community and the general public alike. In addition, SOHO has several times demonstrated its leading role in the early-warning system for space weather. Furthermore, accurate monitoring of the energy output from the Sun is important for understanding any natural variability of the Earth's climate.

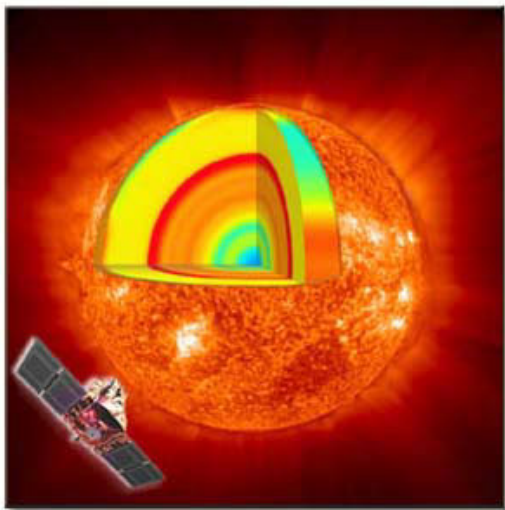
In an anniversary-tied event, 23,990 people participated in selecting the most popular SOHO image. The winning image was *The Sun as a Sparkling Diamond*, shown to the left and on-line at: http://sohowww.nascom.nasa.gov/cgi-bin/top30_detail?TRICOLOR

In addition, SOHO has an impressive list of achievements including:

- Revealing the first images ever of a star's convection zone (its turbulent outer shell) and of the structure below sunspots.
- Providing the most detailed and precise measurements of the temperature structure, interior rotation, and gas flows in the solar interior.
- Measuring the acceleration of the slow and fast solar wind. Identifying the source regions and acceleration mechanism of

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SOHO Team, Elite Ranks (cont'd)



The cutaway reveals rotation speeds inside the Sun. The left side of the image represents the difference in rotation speed between various areas on the Sun. Red-yellow is faster than average and blue is slower than average. The light orange bands are zones that are moving slightly faster than their surroundings. The new SOHO observations indicate that these extend down approximately 20,000 km into the Sun.

the fast solar wind in the magnetically "open" regions at the Sun's poles.

- Discovering new dynamic solar phenomena such as coronal waves and solar tornadoes.

- Revolutionizing our ability to forecast space weather, by giving up to three-days notice of Earth-directed disturbances, and playing a lead role in early space weather warnings.

- Monitoring the total solar irradiance (the 'solar constant') as well as variations in the extreme ultra violet flux, both of which are important to understand the impact of solar variability on Earth's climate.

During eight years of operation, the team has had to face several heart-stopping moments, but with extraordinary team spirit, skill and competence, they turned these episodes into remarkable success stories. In June 1998, control of SOHO was lost and the team fought for three months before regaining contact with the spacecraft. Then all three on-board gyroscopes failed. Again, the team rose to the challenge by reprogramming the spacecraft to completely eliminate the reliance on gyroscopes. In doing so, they crossed another frontier in space - SOHO became the first three-axis stabilized spacecraft to be operated without gyroscopes.

In May 2003, the East-West pointing mechanism of SOHO's high-gain antenna started showing signs of a possible breakdown. With this threat to the mission's lifeline, many people feared once again that the mission was in danger. After a long and arduous diagnostic process and a careful analysis of all options, the team decided to park the antenna in an "ideal" position, where data losses are minimized by rotating the spacecraft 180° every three months. In addition, new procedures and larger ground antennas (when available) can be used to all but eliminate the impacts to normal science operations.

Throughout, the team has continued to produce excellent science and SOHO has revolutionized the way scientists think about the

Sun and how it might affect Earth's environment. More than 1500 papers, representing the work of more than 1500 scientists, have been published based on SOHO data. And with SOHO still going strong, the success story is set to continue.

The SOHO project is the result of an international effort. Fourteen European countries, led by the European Space Agency and prime contractor Astrium (formerly Matra-Marconi), built the SOHO spacecraft. It carries twelve instruments (nine European-led and three American-led) and was launched by an American Atlas II-AS rocket in 1995. The spacecraft was designed for a two-year-mission but its spectacular success has led to two extensions of the mission, first until 2003, and then again until March 2007.

SOHO appeared to be in everyone's focus this fall as the Sun turned from an almost spotless orb into an ominously scarred source of mighty fireworks in just a few days. Over two weeks,

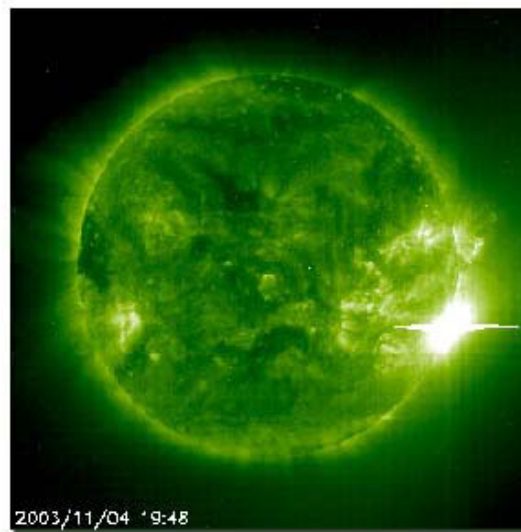


Image taken from SOHO's Extreme ultraviolet Imaging Telescope (EIT) of recent record-setting solar flare on Nov. 4.

it featured three unusually large sunspot groups (including the largest one of this solar cycle), 11 X-class flares (including the strongest ever recorded), numerous halo CMEs (two with near-record speeds) and two significant proton storms which lasted for a combined

five days. Satellites, power grids, radio communication and navigation systems were significantly affected in this period.

The events caused unprecedented attention from the media and the public. Images from SOHO as well as quotes from SOHO scientists appeared in nearly every major news outlet (CNN, BBC, Associated Press, Reuters, to mention a few). Stories including SOHO images made the front page of newspapers and were featured prominently on major television networks.

The attention wiped out all existing SOHO web traffic records (requests/data volume): Monthly (31 million/4.3 TB), weekly (16 million/2.6 TB), daily (4.8 million/0.7 TB), and hourly (0.4 million/33 GB). The daily and hourly volumes were bandwidth limited.

For more on images and information about the SOHO project, visit: <http://soho.nascom.nasa.gov/>. ■